IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	J. Schmitt
Serial No.	:	09/824,936
Filed	:	April 03, 2001
For	:	Plasma Reactor for the Treatment of Large Substrates
Art Unit	:	1763
Examiner	:	Ann M. Crowell

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR 1.132

Sir:

I, the undersigned, Jacques Schmitt do hereby declare:

I have a PhD in Plasma Physics. In the 70's to 80's I was a professor at Ecole Polytechnique (Paris) with special focus on Waves and Electromagnetism. In the mid 80's I shifted from academic to industrial research with special focus on PECVD (Plasma Enhanced Chemical Vapour Deposition). However I kept contact with the frontier of research, regularly appearing as an invited speaker in international conferences.

I understand the English language and have read the above-identified application as well as the patent references to Hanada (JP 08-186094), Shang (US 6,177,023), Sato (US 6,199,505) and Collins (US 5,210,466), discussed below.

I believe that the rejection of the above-identified application as being

unpatentable over a combination of Hanada (JP 08-186094) in view of Shang (US 6,177,023), Sato (US 6,199,505) and/or Collins (US 5,210,466) is not justified.

Hanada relates to a plasma treatment device used for manufacturing semiconductors, such as a plasma treatment device used for etching a silicon oxide film, polisilicon, an aluminium alloy or the like (cited from Hanada [0001]). He suggests using frequencies of 13.56 MHz or lower (Hanada [0005]). A complete, certified translation of Hanada has been made available for the USPTO in October 2003. Therefore the facts and teachings of Hanada should be referred to and understood based on the whole disclosure and not just based on an abstract and the figures. Hanada is focusing on substrates such as wafers. It is commonly known that the usual wafer size in 1994 was 8 inches (max.), or about 20 cm in diameter. The present invention, however, relates to substrates where the reactor size is not negligible relative to the free space wave length of the RF frequency used, which is not the case for treatment chambers for the much smaller wafers of Hanada.

The physical background is that the RF wave is distributed according to the beginning of a "standing wave" spacial oscillation within the reactor. In summary, this effect depends on: (a) substrate/reactor size; and (b) RF frequency used. Since Hanada has a substrate more than 3 times smaller than the smallest substrate dimension claimed AND uses frequencies which are lower than the frequencies claimed, I firmly believe that it is physically impossible that standing wave effects can occur in an RF plasma reactor as shown in Hanada.

Collins teaches a high frequency VHF/UHF reactor chamber system, "configured in part as a transmission line structure [...] to the plasma chamber 33." (col. 4, lines 30 ff). Collins refers to "wafers 4-8 inches in diameter" as being "large" (col. 7, line 59). Although Collins discusses standing wave effects in col. 8, lines 7-10 and identifies them as a problem ("losses" – col. 8, lines 10-13) he proposes to use a matching network to compensate them. The teaching of Collins, therefore, does not only comprise the use of higher frequencies, as stated by the Examiner, but also includes a proposal how to compensate losses due to standing wave effects.

A combination of Collins and Hanada does not address the problem of large size substrates and will therefore not lead to the invention, but rather suggests another solution.

Shang shows a reactor for processing substrates and focuses on a method for holding a substrate on a support layer in a processing chamber (claim 1).

The Examiner cites Shang for his remark about scalability in col. 5, lines 58-63. It is of course well known to scale up and down the (mechanical) dimensions of an apparatus to receive a system of different size. However, the Examiner ignores the fact that simple "scaling up" does not automatically include that the altered system works properly. Unexpected problems may occur. Will a bridge spanning 50m and able to carry a 50 ton truck, being scaled up in an obvious manner to a length of 150m still have the same carrying capacity? One would – in a quite unobvious manner, re-calculate the statics and perhaps find out that such a bridge has to be enforced.

Returning to the present invention, scaling up a reactor will create the problem of non-uniformity, but will not solve it. Therefore the teachings of Shang, combined with Hanada and/or Collins do not render the invention obvious.

Sato describes a processing system for large size substrates with VHF (30-300 MHz) frequencies. Sato proposes a different construction of the transmission path within the chamber. Sato is, according to my findings – silent about problems in layer homogeneity. Sato does not propose or need a dielectric layer with at least one non-planar surface.

There is no motivation, teaching or suggestion in the prior art for a person of ordinary skill in the art to which the present invention pertains, to copy the apparatus of Sato in order to process large sized substrates. There is no motivation to combine the teachings of Sato with Hanada, Collins and Shang.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Jacques Schmitt

Date: Feb. 24th/2006